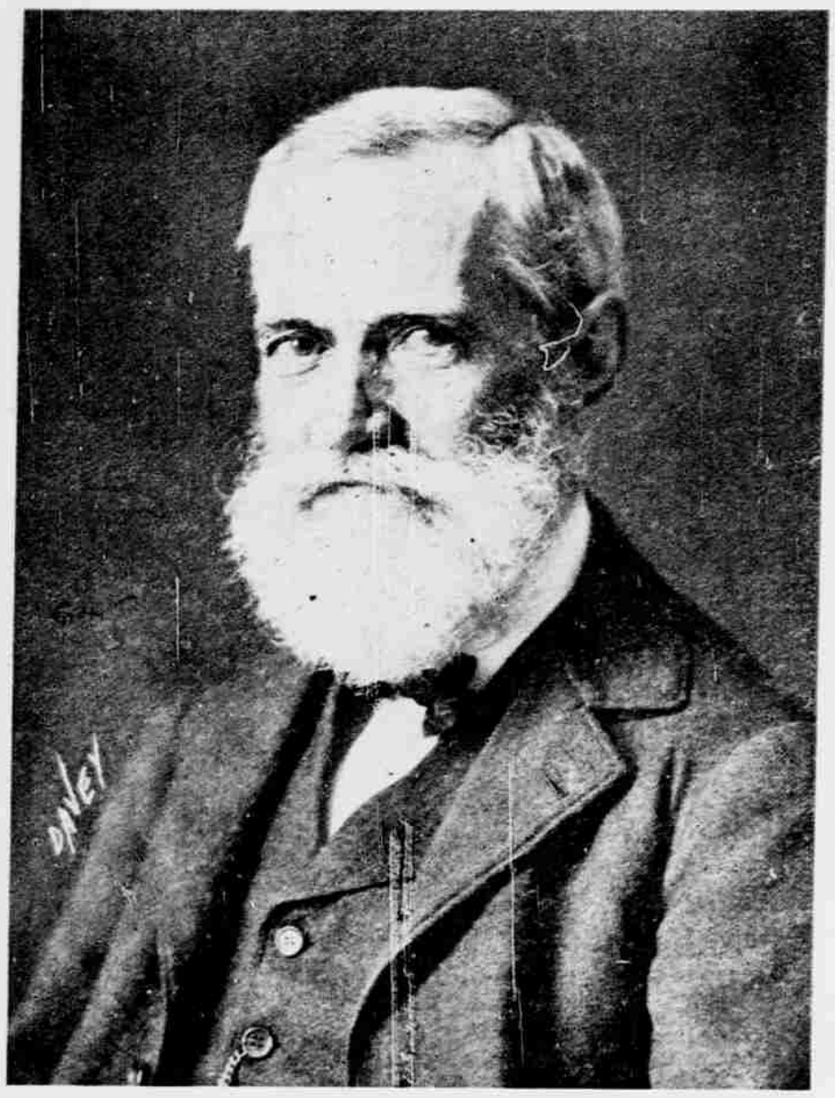
METEOROLOGY
IN HAWAII

By CURTIS J. LYONS, Territorial Meteorologist.



HON. CURTIS J. LYONS.

Curtis J. Lyons was born at Waimea, Hawaii, in 1833, his parents being of the missionary band who arrived the year previous in the whaleship Averick from New Bedford. His father, the Rev. Lorenzo Lyons, was a man of very considerable attainment and has been considered preeminently the lyric poet of Hawaii.

After a three years' attendance at Punahou College he joined, in 1850, the Land Commission for locating Kuleana and land grants, remaining with them for three years, during which time he acquired an extensive knowledge and acquaintance with the early land system, which has been of the greatest value to the department and governments ever since. Having now earned sufficient to take him through college he entered Williams College in Massachusetts, graduating in 1858. He then applied himself to the study of theology, but at the end of two years his health failed compelling his return to the Islands where he recovered in due time. He then entered the newspaper field, working on both the Kuokoa and Advertiser as translator and editorial writer. He was also a member of the legislature during two sessions.

He joined the Government Survey Service in 1871 and has been connected with the department ever since. He was for many years working triangulations and in charge of the office and the present efficiency of the system is due largely to the joint labors of Prof. W. M. Alexander and Curtis J. Lyons. Since 1896 Mr. Lyons has had charge of metereology and his daily reports are a feature of the newspapers.

Meteorology in Hawaii.

THE INTEREST in Hawaiian meteorology is two-fold. In the first place the climatic interest. The far-famed climate of Hawaii needs to be put into definite figures that it may be scientifically and accurately stated, and not given out as a mere impression. The rainfall and the probable character of succeedng seasons is needed for industrial discussions and plans.

In the second place, Hawaii's share of service in simultaneous or sychronous meteorology must be rendered. Meteorologists throughout the world are more and more working together. Particularly the United States is interested in the relation of Pacific Ocean conditions to those on the mainland. All the facts obtainable are wanted.

The local government work in this direction began in a very small way within the government survey in 1881, entirely as a voluntary service, superadded to the surveying duties of the office. First the barometer, and later on the temperature and wind and cloud observations were made. Instruments were standardized by comparison with those of scientific government parties visiting Honolulu. In 1883 the rainfall record was undertaken, and the occupation of the present station at 1508 Alexander street, Punahou, began. In 1890, at the direction of the then Minister of Interior, Lorrin A. Thurston, the systematic collection of rainfall data began, many of the observers taking up the matter in response to letters from the Minister himself. There are now about eighty station reporting rainfall. At the same time the weekly publication of a summary which appears on the last page of the Advertiser, also in the Gazette, was instituted and continues to this day.

A report prepared by the writer was published in 1890, as a part of the Biennial Report of the Interior Department, in which all obtainable records by private parties up to that date were summarized. This has proved a valuable summary, but the separate edition was long since exhausted.

About that date the study of the humidity of the atmosphere was taken up. Previous to that time, very little really accurate work in that line had been done anywhere, even in Europe and America, owing to crudities in practice, and even now the moisture is apt to be over-estimated.

The United States Weather Bureau and the Hydrographic office both requested, in the early nineties, to have detailed records sent them, which has been done regularly. Owing to the fact that this station, so to speak, commands so large a portion of the earth's surface the detailed record for every day of the month is published in the United States Weather Review. In the event of a cable being laid to the mainland, most of the items will appear on the daily weather map published at Washington, as is the case with other cities. It may be remarked here that a full file of this daily map comes to the meteorological office here by every mail, and can be consulted by anyone applying.

For three years past the leading papers have been furnished by telephone with the daily weather items, including the dew point and humidity, to accustom the public to the use of these items as affecting the weather. The effort to furnish forecasts for short periods ahead was taken up at the request of the papers themselves, and has proved in a measure successful. Of course, there is not a background to the west to draw information from by telegraph as on the mainland. Should a cable be laid to Midway Island, it would be of service in the winter time, as the winter storms and changes come from that direction.

The annual reports for six years, viz., 1892-1897, inclusive, were published. Copies of all but 1892 can be had. 1898 to 1901 are soon to be published, and what will probably be appreciated, a pamphlet containing the monthly rainfall for every station for the entire period of observation.

As to results: The mean annual temperature of Honolulu at sea level is 74 F. different years varying from this not over half a degree one way or the other. The mean of 6 a. m., 2 p. m., and 9 p. m. is taken as the standard average, the mean of maximum and minimum being slightly too high, generally taking an entire month being about .7 of a degree. It is a common idea that the temperature on the windward side of the Islands is much less, but it is doubtful whether any place at sea level is over a degree cooler than Honolulu. To compare this place with the West India islands, while the temperature there has no doubt been over-estimated, it is probably not less than a mean of 78 degrees, being four degrees higher than ours, which is quite a difference in the tropics.

With elevation the temperature diminishes in varying ratios in different localities, sometimes as rapidly as one degree F. in 200 feet, elsewhere only a degree in 400 feet. Probably 1 degree in 300 feet is a fair average. The daily range in Honolulu is 11 degrees average. At greater elevations it is greater, viz., 15 or 16 degrees. On the windward coasts it is less; at Pepeekeo, Hilo, 7 degrees. The monthly temperatures vary at Honolulu from 70 in January to 78 in July and August. Our extremes are generally 54 degrees to 88 degrees. Rare instances of 50 degrees and 90 degrees have been noted.

The humidity makes more difference in what is termed the sensible temperature than the temperature itself. The thermometer at 80 degrees with the dew point at 62 to 64 degrees, gives a very comfortable atmosphere; at 75 degrees with the dew point at 70 to 72 degrees, it is decidedly oppressive. Rapid evaporation in the first instance cools the skin, and frees the lungs; in the other case the lack of it blocks the pores and the cells. But curious to say, a sudden fall in the dew point is only bracing to the strong. It precipitates colds on all the sensitive ones. Our average dew point is 64 degrees, or 6.6 grains of moisture to a cubic foot of air; and our relative humidity or percentage of saturation 72 per cent, which is no higher than that of maritime cities on the mainland. San Francisco's humidity is about 76 or 78, and the West India islands mark up to 80. This is one of our strong points.

The trade winds blow here on an average 260 days in the year. A good deal of what is called south wind is merely a sea breeze. There is such a thing as land breeze at Honolulu; it is very faint and comes from the Ewa mountains. The disturbances here in the winter time are mostly caused by the southern edges of the great circular or revolving storms that pass across the Pacific Ocean from Japan, going well to the northward and landing on the American coast. Some come up from the southwest, and are probably the genuine "Konas," which are rare. It would take more space than is here allowed to explain, and to tell the truth there is much yet to learn. November and February carry the heaviest rain records. December and January are sometimes very delightful months, and sometimes the contrary. It depends on the belt of latitude on which the storms moved, what is the character of the winter.

The rainfall of the Islands is an extremely interesting subject from its external variety. We will take Honolulu, and the fundamental principle in rain science that when air is moist and is thrown from sea level to a high altitude it cools and has to part with its burden of water, i. e., it rains. The winds strike the Koolau mountains, Konahuanui, etc., and shoot upward and onward, and the heavy rain falls at Luakaha and in Manoa, 120 inches a year. The wind, on the other hand, comes around Koko Head and around over Waialae and Kapiolani Park, and is not sent upward, and it rains there hardly 20 inches a year. All intermediate amounts imaginable are found between—37 inches in the suburbs and 30 inches in town.

On the same principle as mentioned above, the huge mountains Mauna Kea and Mauna Loa cause the heavy rains of Hilo and Olaa, amounting to an average at different points of anywhere from 100 to 200 inches annually. Kaumana, just above Hilo Town, carries the record for authenticated monthly rainfall, viz., 55.58 inches, also 231.84 for the year. Hana, Maui, has the highest 24-hour record, 30 inches in 48 hours. Some places on the lee coast of Hawaii probably do not have over eight inches per year, though that is not proven. The Kona forest belt has its rainy season in July and August. This is exceptional, and is caused by sea breeze and back current of the trades combined, carrying the sea air up the mountain slope.

The balmy character of the Hawaiian atmosphere is derived largely from the fact that the supply comes from a high elevation. That is, the air goes to the equator as trade winds, there rises,parts with its moisture in the heavy rains of that belt, comes back overhead as the S. W. upper current, descends to sea level about latitude 30, and comes down to us as the fresh N. E. trades.

Hawaiian meteorology is therefore not the monotonous subject that it appears at first glance.